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DISEASES OF THE NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

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DISEASES of the NERVOUS SYSTEM

(PUBLISHED MONTHLY)

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

A "Natural Order" of Abnormal Reactions *

OTTO KANT, M.D.
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The history of psychiatry is one of changing aspects and attempts at systematizing the accumulated knowledge. After the chaos which, in spite of excellent psychological observations, prevailed up to the end of the past century, the descriptive psychiatry of Kraepelin marked great progress. For the first time there were established basic differentiations in the field of functional mental disease. With growing interest for the psychological problems involved and with increasing experience that the clinical reality does not always correspond to dogmatic nosological entities, a more complex understanding of abnormal conditions was sought. Factors such as personality, physical features, social environment and peculiarities of the life situation were taken into account which in working together seemed to foster the abnormal reaction. Adolf Meyer's term "psychobiology," in America, and Birnbaum's and Kretschmer's "pluridimensional diagnosis," on the Continent, denote this psychiatric attitude.

With general stressing of the psychological and socio-psychiatric aspects, the nosological interest has gradually waned to the extent that the problems involved in differentiating abnormal reaction types have become rather neglected. A new approach to clinical systematization, which after all is the basis of all medical diagnosis, prognosis and therapy, is therefore proposed by the author. It should be emphasized that the referral to constitutional and nosological points of view by no means implies a regression to the therapeutic nihilism of earlier psychiatric decades. Acknowledgement of inherent differences of personality structure is well commensurable with therapeutic activity. Indeed it is believed that individualizing therapy pre-requires a precise understanding of the patient's peculiar reaction type.

Recognizing that the purely descriptive level no longer yields any prospect of enriching our knowledge, a scheme is devised which approaches the problem of systematization as one of inherent psychobiological relationships. Instead of describing differences between reaction types as such, the attempt is made to develop a "natural order," in which the relation between different reaction types and between personality types and reactions becomes apparent. In other words, instead of an arbitrary system a scheme is evolved which expresses the inherent possibilities of normal and abnormal reaction. Though this study thus primarily follows a theoretical purpose, its deductions should necessarily have bearing on the very practical questions of diagnosis, prognosis and therapy.

It may be stated at this point that the author is not at all interested in devising a new psychiatric nomenclature. The new terms used are unimportant in themselves, serving only to express a procedure which is con-

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sidered promising for clinical comprehension of abnormal conditions.

It is believed that the "natural order" of abnormal mental reactions is derived from two basic principles: a) that there are fundamentally three different attitudes which the psychobiological personality can assume in reacting to stimulation and b) that similar reactions occur on different levels of the personality. Our heuristic system, therefore, approaches the abnormal reactions from two different points of view: 1) that of the basic 3 reaction types; 2) that of the stratification of the personality and the relations between "a" and "b."

THE REACTION TYPES

Embracing both normal and abnormal reactions, it is proposed that there exist three basic types representing the three possible responses to stimulation. At one end there is the reaction characterized by uniform acceptance of and contact with the reality world which is known as that of the cyclothymic or extrovert (Jung's term being used in a modified sense) personality type. This type of reaction is possible only where there exists a basically harmonious and clearly directed system of urges and tendencies, i.e., a uniform character which permits the reaction of the personality as a whole, swinging between the two poles of elation and depression. With Ewald[1] we distinguish between the *temperament* as the predominant mood background of the personality and the *character* as the system of urges and tendencies. Thus being harmonious and well-balanced, the extrovert personality impresses one chiefly by its general mood background, and, vice versa, prevailing harmony of the personality structure is a prerequisite for expression of temperament to prevail.

The *mood reaction,* therefore, is the most characteristic pattern of the cyclothymic personality. Whatever stimulation occurs, the personality reacts as a unit, either in the direction of inhibition or lack of inhibition of the total functioning personality on all somatopsychic levels, of decrease or increase of the vital tone, and the tempo of mental functioning. This cyclothymic reaction type has been contrasted by Kretschmer with the schizothymic type who because of his in itself contradictory personality structure reacts predominantly with changes in his dynamics, i.e., in the realm of his urges and tendencies. He is the other extreme exhibiting truly the counterpart of the extroverted attitude. Stimulation affects chiefly the relationships within his system of urges and tendencies, i.e., his character, which is more complex and therefore more precariously balanced than that of the extrovert personality. Instead of uniformly reacting *with* the reality environment he secondarily tends to withdraw and to defend himself by introversion *against* the reality world, the influences of which threaten his more complex and therefore contradictory structure. He is nothing less than harmonious in his dynamics as well as in his resulting attitudes. He too may be subject to change of mood and mental tempo.

However, inhibition or lack of inhibition are not as impressive, receding before his prevailing dynamic or character reaction (expressed in the mechanisms of introversion, suppression and "splitting off" of tendencies). It is this peculiarity of "splitting off" which in the psychotic reaction schizophrenia may lead to more or less complete disintegration of the personality. The schizothymic has less possibility of saying yes or no to the outside world than of remodelling an intolerable reality into his "private world." The more pronounced introversion and tendency towards "splitting off," the better he succeeds in erecting his own substitute world in which he reimburses himself for the inclemencies of life or onto which he may project his own inferiority.

As is particularly evidenced by certain psychopathological reactions, there occasionally occur combinations of the two types so far mentioned. There is a variety of schizophrenic patients — the paraphrenic in Kraepelin's terminology—who combines an extrovert temperament with a highly bizarre and unrealistic "private world" hidden under the smooth surface. Here one may say that characteristics of both reaction types coexist, representing different parts of the personality.

In addition to this combination of types, there is a third basic reaction type which actually is *between* the other two and partly related to both though not representing a true combination of the peculiarities of either type. If one may draw a line from the extrovert attitude of the cyclothymic personality to the other extreme of introversion, one reaches a point where there still exists a certain immediate contact with the outside world, though the ability to react freely *with* it has already become lost. Instead of a uniform dynamic direction, there results increased *inner friction* in the system of urges and tendencies which embraces the total personality, and tends to lead it towards splitting off and remodelling of an inner world. This latter procedure cannot succeed readily because the influence of the outside world is still too great in this reaction type. However, the relationship becomes unfree; i.e., it lacks the mobility of exchange seen in the extrovert. Compensating for the tendency to withdrawal there often is exhibited particular scrupulousness. The clear uniformity of the cyclothymic structure is lacking but the divergent tendencies of his personality still cling together. Thus this type is unable to realize a pattern which would permit the schizoid "splitting off" of contradictory impulses. Instead of either mood reaction (cyclothymic) or character reaction (schizothymic) outstanding, therefore, are changes in the flow of mental activity which alternates between periods of gradually increasing inner friction and of somewhat explosive release of activity.

Because of these characteristics which form the basic pattern of all "explosive" reactions this third "in-between" type is designated as the *Intermediate* or *Epileptothymic* reaction type. From its position *between* the cyclothymic and the schizothymic type, to both of which it is related, the main characteristics of the personality type can be understood. They are lack of inner freedom and clear structure with tendency towards inner friction, rumination and irritability which may precipitate abrupt and explosive reactions. More or less all other characterstics of this reaction type can be deduced from these features. The subject's assets are his persistency, his urge to "dig in" deeply, his ability at "creative rumination." On the negative side, one may mention pedantry, circumstantiality, and in the ethical field often bigotry, which stems from the lack of inner freedom, and also from the compensatory warding-off of inner explosive rebellion.

In the abnormal case the inner rebellion tending to withdrawal into a private world remains chaotically formless and therefore attitudes so frequently have the color of instinctive primitivity. The possibility of reacting by withdrawal and inner rebellion fails. The chains cannot be loosened; they can only be "torn apart." Instead of the calm and clear reconstruction of reality there exists only the alternative of an explosive reaction. This pattern, whether it is realized on the psychological level or as a result of brain organic disturbance, represents a reaction characterized by clouding of consciousness. In this setting there can be reached but a temporary withdrawal from reality. When the explosive reaction ebbs off, the archaic fantasy invasions recede like the related dream world. To sum up the characteristics of this third basic reaction type: he is still tied to the outside world but no longer able to react freely with it; on the other hand, he tends to "splitting off" and remodelling of reality which in the abnormal case he cannot achieve in clear, autistic withdrawal from the outside world but only temporarily in a setting of explosive clouding of consciousness.

Since the work of Kretschmer, the correlations between the two main types of functional psychoses (manic depressive psychosis and schizophrenia) and the cyclothymic and schizothymic reaction type have become common knowledge. It is proposed by this author that the third basic reaction type, the epileptothymic type, contains the pattern for two different groups of abnormal reactions. The pattern of clouding and explosive reaction is seen, on one hand, in the group of epilepsies in seizures and clouded states, and, on the other, in the variety of so-called symptomatic psychoses which represent the response of the brain to various

exogenous damaging agents (toxic, infectious, traumatic). While the epileptic fit shows the explosive reaction on a purely physical level, the mental equivalent of epilepsy as well as the "symptomatic" psychoses are characterized primarily by a clouding of consciousness, in which setting any kind of psychotic symptomatology may invade the mind much more readily than in a state of clear consciousness. The clouding tends to be temporary only. With return of clear consciousness the abnormal productions usually recede.

The relations between psychosis and personality type have been most methodically studied for the two chief groups of functional psychoses. Though this cannot be claimed for the relation between the epileptothymic type and the symptomatic psychoses, it seemed feasible to the author to stress the analogy between these types of abnormal reactions and the normal reaction pattern of the so-called epileptothymic type. This analogy would exist even if relations between psychosis and personality types were not established.

Starting out with the three basic reaction types and the related psychotic reactions, it is proposed that all other types of abnormal reaction, including the reaction patterns of the psychopathic personalities, represent modifications of the three basic attitudes conditioned by a difference in the "setting" from which they originate.

This difference in "setting" concerns the "localization" of symptoms and reactions within the personality. In a previous study on differential diagnosis of schizophrenia,[2] the concept of stratification of the personality was applied. This concept implies a distinction between various functional (not anatomical) strata, not disregarding, however, the unity of personality. The concept of stratification which later has been employed by several authors with various connotations was first introduced into clinical psychiatry by Kurt Schneider. Impressed by ideas of the philosopher Scheeler, Schneider tried to distinguish between different strata of emotional experiences in depressed conditions. Our use of the concept of stratification refers to experiential as well as to objective differences in personality structure.

PERSONALITY STRATIFICATION AND DIFFERENCES IN SETTING

In the psychobiological organism three strata may be roughly distinguished: the deepest stratum comprises the functions of the organism on the somatic level; the highest stratum is represented by the psychological functions; between these two there is an intermediary stratum which may be designated as the *vital* stratum and which has intimate relations to both the psychological and somatic strata. In spite of the unity of the personality, in most cases one can distinguish sufficiently between the psychological and somatic functions. There is, however, a large group of phenomena regarding which such a distinction is not possible. There are many experiences of which the subject is at a loss to say whether they are part of his physical sensations or of his mentality. Actually they are "borderline" experiences related to both spheres and yet not definitely part of either. The vital tone of the personality, the general feeling of "aliveness" and of wellbeing, various experiences of tension and pressure fall into this category, thus representing the fundaments of the personality, beneath its psychological representation. This group of phenomena, to which the term "vital stratum" refers, has a number of empirically demonstrable characteristics, the most important of which will be discussed. It is our theory that the true functional psychoses are not restricted to the psychological level but that the vital stratum is always more or less involved.

Stratum Criteria: Empathic understanding is restricted to the psychological stratum; when the vital stratum is involved also, empathic understanding is always incomplete. The "empathic index," a term introduced by Southard, indicates the degree of one's ability to "feel oneself" into the patient's mind (The Empathic Index in the Diagnosis of Mental Disease, J. Ab. Psychol., 13: Apr.-Feb. 1918-1919, p. 199). Though there usually are psychological factors involved in functional psychoses permitting us to "feel ourselves" into the con-

dition, we will always notice that there is a limit to our psychological understanding. While in reactions restricted to the psychological stratum of the personality the basic occurrence is chiefly a conflict of psychological tendencies, in conditions involving the vital stratum there occur changes in the fundaments of the personality which we can understand only in the meaning of "as if." We can draw parallels between these occurrences and psychological experiences into which we can feel ourselves. However, we are aware that these comparisons represent analogies only and that actually there are fundamental differences.

The above-mentioned stratum criteria will best be exemplified by application to the three basic types of functional psychoses in which it is our theory that the vital stratum always is involved.

Manic-Depressive Psychosis. On superficial view one might believe that we can completely feel ourselves into manic-depressive reactions since they represent nothing else but the morbid exaggeration of normal, emotional reactions: joy and sadness. An analysis of typical manic-depressive reactions will show that this view is definitely false. Though the conditions are more or less accompanied by elation and sadness respectively, these two emotional aspects are rather peripheral. Depressive patients frequently state after their recovery that it was one of their worst experiences that they could not even feel sad and that it was a great relief to them when for the first time again they felt emotionally stirred up and could "have a good cry." Actually, the basic occurrence is a change in the vital tone of personality and in the tempo of its functioning. The word "sadness" characterizes the mental attitude of the depressed patient much less than the word "de-pression" which refers to the borderline experience of "heaviness" and the loss of normal tone which pervades the physical part of the personality as much as its mental aspect. For example, the gastro-intestinal system exhibits the "depression" in lack of appetite, heavy sensations in the stomach region and constipation. Also, every typical depression is accompanied by four features which defy purely psychological interpretation: in addition to constipation there are loss of weight up to the height of the illness (which is not explained by the decrease of food intake alone), sleep disturbance and daily fluctuations (the depression is worse in the morning, tends to recede temporarily in the later afternoon).

Similar considerations hold true for the manic patient. Though he exhibits a euphoric mood, actually again changes of tempo and vital tone which defy psychological interpretation are the basic occurrences. In the manic state, the patient is not truly productive at all since a basic disturbance of his thought processes has deprived him of the ability to steer his thoughts into any wanted direction; and a searching interview will usually show that behind the easy-going volubility there is much tension and "keyed-up" irritability.

Schizophrenia: The basic symptoms of "splitting" which gave this disease its newer name does not refer to mental conflicts the way people often talk of themselves as a "dual personality." The "splitting" of schizophrenia indicates the disintegration of the personality as a whole and of its individual functions (disintegration of thought, emotion and volition), which can be still less empathetically understood than the mood disturbance of a depressed patient. The volitional disturbance is not due to any psychologically motivated indecision but to a disintegration of the volitional mechanism. Because a basic disintegrative process is outstanding in schizophrenia, there is so much regression to more primitive ways of functioning; e.g., instead of expressive movements the excited catatonic patient may show primitive rhythmic stereotypies for hours. Also, the "deep" localization of the schizophrenic process is shown in the occurrence of symptomatology which either is or at least imitates the brain organic type (e.g., "ointment face" and salivation of many catatonic patients).

Epilepsy and Symptomatic Psychoses: The epileptic seizure as an explosive reaction lacks all expressive quality in its onset as well as during its short course. It is entirely a physical phenomenon which exhib-

its temporarily signs of organic impairment of the central nervous system (fixed pupils, positive Babinski). The clouded states of epileptic patients lack the expressivity and dramatic quality of clouded states which are restricted to the psychological stratum. Morbid impulses and experiences are of a more primitive and unmotivated character than in the clouded states of "higher" localization. Frequently brutal aggressive acts are committed (such as homicide by stabbing, strangling, etc.) which are not at all purposively motivated but are an expression of impulsive primitive aggression. They are apparently independent of the general psychological situation of the epileptic and beyond the reach of empathic understanding. The frequent periodicity of these outbursts also is indicative of biological rather than psychological relationships. Hallucinations are on a primitive level. Threatening sounds and noises and particularly optic hallucinations of fiery colors are experienced much more than well-formed hallucinations. On the whole, these clouded states, as well as those on a toxic or other brain-injury basis, have much more of an organic than a functional character. They are characterized by incoherence and disorganization of all productions rather than by expressive scenes of dramatic color.

Abnormal Conditions Restricted to the Psychological Level: If in abstracting from clinical detail one wishes to designate the primary occurrences in the previously discussed functional psychoses one observes the triad of change of mental tempo, clouding with disconnectedness and remodelling of a private world. In abnormal conditions restricted to the psychological level there occur analogous reactions which, however, exhibit certain fundamental differences.

A. Mood reactions (reactive depressions and compensatory manic states) are characterized by and depend on the psychological situation not only as to precipitation but also as to the entire course. Sadness and elation are more outstanding than the "heaviness" and the "speeding up" of truly manic-depressive conditions, while there is a lack of accompanying physical symptoms observed in the former.

B. Analogous to seizures and clouded states on the vital level, there is the variety of psychogenic seizures and of so-called hysterical, clouded states. Both reactions are known for their expressiveness and their dependence on psychological factors. While the epileptic seizure is characterized by its lightning-like onset, its "organic" picture and its short duration, the hysterical fit ranges between a primitive type of defense reaction (which Kretschmer has compared to the attempts of the ameba to evade danger by seeking escape in all directions) and a well coordinated expressive action which for example may closely emulate sexual intercourse. The importance of a receptive audience which is to be impressed by the seizure is well known. Psychogenic clouded states on the whole can be designated as primitive reactions of a highly dramatic type. Instead of solving his problems on the mature abstract thought level the patient regresses to acting out his problems on the "picture-book" level of his dream world. As opposed to the frequently quite incoherent fragments of "organic" clouded states one can usually readily understand the dramatization of an experience which the individual is abreacting by acting out (e.g., a repetition of emotionally impressive battle scenes, etc.).

C. Autistic manifestations comparable to schizophrenic experiences, however, without the fundamental splitting of mental functioning, are represented by the schizoid reactions on the psychological level. Certain acute prison reactions which on superficial view closely resemble paranoid schizophrenic psychoses are a good example. With their massive hallucinations and paranoid trends they seem to emulate acute schizophrenia. However, the psychological continuity is maintained during the entire course of the psychotic episode. There always remains a whole personality which is having psychological experiences as opposed to the disintegration of the truly schizophrenic individual. Some of the so-called psychoses on a psychopathic basis which represent a psychotic exaggeration of psychopathic trends under increased strain fall under the same heading. Certain types of

catatonic stupor which usually are diagnosed as schizophrenia but in clinical peculiarities differ greatly from the rather destructive average catatonic type can also be designated as schizoid reactions. In these patients one can observe that the psychosis which is rich in dramatic experiences such as rebirth and other cosmic happenings is a grandiose attempt to solve an intolerable conflict on a psychotic level.[3]

Relation to Personality Types. It is interesting to note that the personality types which so far have been most elaborately studied, i.e., the cyclothymic and schizothymic personalities bear much closer relation to the corresponding psychoses involving the vital stratum of the personality than to comparable abnormal reactions restricted to the psychological level. The pure extrovert and physically pyknic types are usually found associated with manic-depressive psychoses while the typical pre-psychotic personalities of later schizophrenics usually exhibit schizoid features. Also as far as opinions can yet be formulated the characteristic epileptoid egocentricity, "stickiness" and circumstantiality are at least more a part of the epileptic than of the comparable psychogenic personality.

The three basic personality types are much less closely associated with comparable conditions on the psychological level. The prepsychotic personalities in reactive depressions tend to lack the extroversion and the emotional warmth of typical cyclothymics while the personality types in schizoid reactions may surprise one by their good pre-psychotic and post-psychotic emotional contact with reality. The pre-psychotic personality in the intermediate hysterical reaction is characterized much more by irritability than by the other features of the epileptothymic character ("stickiness," circumstantiality, etc.). In other words, certain admixtures deviating from the prepsychotic type characteristic of the vital psychotic conditions are found in the prepsychotic personalities related to reactions on the psychological level. Furthermore, the relationship between personality type and reaction seems less pronounced than a certain unifying disposition to abnormal psychological reactions. However, this disposition does show close relations to certain types of psychopathic personalities which is significant from the point of view of envisioning general biological relationships between different types of abnormal reactions and abnormal personality types as such.

Psychopathic Personalities: Attempts to elaborate on a system of psychopathic personalities have been manifold. However, neither clinical-descriptive systems nor other approaches have succeeded in devising a meaningful scheme of inherent relationships between the different types of psychopathic personalities. It is my theory that the varieties of psychopathic personalities are centered around the basic three reaction patterns. In other words, there are three basic possibilities of psychopathic deviation from normality. The deviation concerns either the mood-reaction, the character reaction or the intermediate reaction. Instead of exhibiting circumscribed abnormal reactions either on the psychological or on the vital level, the psychopath in his inherent make-up presents a deviation in one of these three reaction patterns.

TABLE I.

Clinical Types of Psychopathy Described by E. Kahn[4] Enlarging on an Older Scheme of K. Schneider.

1. The nervous p.	9. The affectively cold p.
2. The anxious p.	10. The weak-willed p.
3. The sensitive p.	11. The impulsive p.
4. The compulsive p.	12. The sexually perverse p
5. The excitable p.	13. The hysterical p.
6. The hyperthymic p	14. The fantastic p.
7. The depressive p.	15. The cranky p.
8. The moody p.	16. The eccentric p.

For reasons of clinical demonstration it seemed advisable to use the scheme of E. Kahn in an attempt to embrace the descriptive varieties of psychopathic personalities.

If one discards only two of Kahn's types, (1) the nervous p. (who actually is not a special type of personality make-up but an individual characterized by neuropathic weakness) and (2) the sexually perverse (who actually exhibits the negative of a neurosis), all types, without artificiality, can be grouped under the headings of deviations in the three basic patterns.

TABLE II.

The Relation of Kahn's Clinical Types of Psychopathy to Deviations of the Three Basic Reaction Patterns.

A. Temperament Reaction	*B. Intermediate Reaction*	*C. Character Reaction*
6 hyperthymic	2 anxious	3 sensitive
7 depressive	5 excitable	4 compulsive
8 moody	11 impulsive	9 affectively cold
	13 hysterical	10 weak-willed
		14 fantastic
		15 cranky
		16 eccentric

The features under A are self-explanatory as expression of a lack of balance of the prevailing mood reaction. All peculiarities assigned to B refer either to an increase of tension and explosiveness of the intermediate reaction (2, 5, 11) or its tendency to regress to a different stage of consciousness (13). Disturbances of the character reaction express either the threat resulting from stimulation (3) or the "splitting off" defense mechanisms (4, 9, 10) and their autistic results (14, 15, 16).

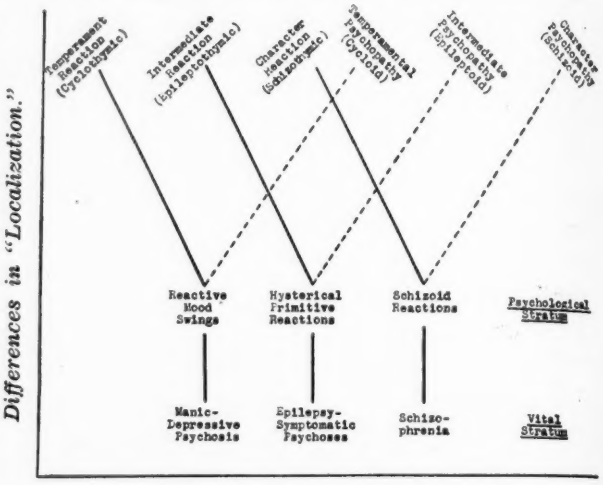
To distinguish again the psychopathic personality from the one who exhibits temporary abnormal reactions, the main difference lies in the inherent abnormal make-up of the former. One might say the cardinal disturbance of the psychopath is a certain lack of stability and of control, a "loosening up" (of his personality) in one of the three basic forms of reaction, without any changes of the personality as a whole. In spite of being unbalanced in its inner relationships, the personality retains its unity and composure, the "loosening up" thus not representing the total disturbance of a psychotic reaction.

While differentiation between the reaction patterns and their association with certain personality types were most clear-cut on the vital level of psychotic conditions, the differences were observed to be less pronounced on the level of psychological reactions. Most overlapping occurs in the psychopathic personality. Though one of the three patterns is usually chiefly affected, the "loosening up" tends to pervade the whole personality. Not infrequently, therefore, it is a matter of opinion whether one wants to stress more the lack of temperamental balance or the impulsiveness or the weak-willedness of an individual psychopath.

In order to sum up graphically the relationships which so far have been discussed successively the following table was devised. In it normal and psychopathic reaction patterns are both denoted as referring to the same corresponding types of abnormal reaction since clinical investigations have not yet sufficiently determined the relative prepsychotic weight of the psychopathic makeup.

TABLE III.

A Natural Order of Abnormal Relations.



The Three Basic Reaction Types.

Neuroses: It will be noted that our scheme makes no special mention of the neuroses which, one might argue, should be part of a "natural order" of abnormal reactions. The reason for the omission is as follows. Actually the neuroses comprise a heterogeneous group of phenomena. Certain types, such as reactive depressions, hysterical seizures and clouded states, which represent a temporary change of the personality as a whole, are referred to as abnormal reactions restricted to the psychological stratum. Other types of neurosis (anxiety neurosis, obsessive-compulsive neurosis, conversion-hysteria) are part-reactions, which in the author's opinion develop on a psychopathic* basis and are precipitated by certain conflict situations.** While neurotic anxiety shows

*The term "psychopathic" used in the broad sense of Kahn's concept.

**The accent being either more on the constitutional-psychopathic or the psychogenic-situational side.

closest relations to the explosive and tense intermediate type, obsessive-compulsive phenomena and conversion hysteria belong to the sphere of psychopathic character reactions. And indeed there are particularly all kinds of transition between certain obsessive-compulsive and certain schizophrenic manifestations (the obsessive psychosis of older psychiatry).

CONCLUSIONS FOR DIAGNOSIS, *PROGNOSIS AND THERAPY*

While diagnostic labeling in functional conditions has degenerated to a technically necessary but lowly regarded procedure by using a scheme that incorporates the new points of view devised in this study, the diagnostic approach may again become more meaningful and helpful for prognostic and therapeutic considerations.

DIAGNOSTIC DIFFERENTIATION

The fact that psychotic symptoms have an entirely different meaning whether they appear in a clear mind or in a setting of clouded consciousness has so far not been adequately stressed in textbooks. While psychotic invasions in clear consciousness definitely indicate the presence of a severe psychotic condition, even if only a single hallucination or paranoid projection is reported, a wealth of psychotic material need not have any bearing on the severity of the mental condition if it occurs in a state of clouded consciousness. Whenever the control of consciousness is inactivated (such as normally in dream experiences) archaic and autistic patterns may readily invade the mind while they just as quickly tend to recede after clear consciousness has been regained. If, however, in spite of clear consciousness, abnormal trends come to the surface there must have taken place a serious disintegration of the personality which generally tends to be much more lasting.

Taking the state of consciousness into consideration, the differentiation of three basic reaction patterns permits a more adequate and meaningful diagnostic classification. This viewpoint is supplemented by another feature which so far has not been generally utilized in the literature: the importance of the setting in which abnormal symptoms and reactions arise. The frequent misuse of terms such as "split personality" and even of "schizophrenia" would not occur if the fundamental difference between a psychological reaction and a reaction in which the vital stratum is involved were more commonly appreciated. Differential diagnostic considerations gain a new precision if the difference in "localization" within the personalty is considered.

Finally, the possibility of viewing the various types of abnormal reaction and of psychopathic personality in one concept provides a more satisfactory and "natural" order of functional abnormality than any other kind of descriptive or analytical systematization.

PROGNOSTIC DIFFERENCES

Prognostic considerations should start with the diagnosis of the reaction type and then consider its respective setting.

A. Temperament Reactions: It is well known that temperament reactions on the vital level, the manic-depressive episodes, are self-limited, usually leading to recovery. The more closely associated these episodes are with the cyclothymic (extrovert, pyknic) personality type the better, according to the comprehensive study of this problem by Mauz,[5] is the prognosis. Course and outcome are somewhat different in psychological mood reactions. They lack the self-limitedness of the vital manic-depressive psychoses and recovery therefore depends much more on the solving of the precipitating conflict situation.

B. Intermediate Reactions: The prognosis of the rather heterogeneous group of epileptoid reactions, though generally fair, depends largely on the underlying pathology and its therapeutic accessibility. While reactions on the psychological level refer to personality problems prognosis of the symptomatic psychoses depends more or less on the systemic recovery from the original injurious agent. Epilepsy, if not itself "symptomatic," is not cured but controlled by individualizing medicinal treatment.

C. Character Reactions: The prognosis of schizophrenia must be considered as guarded

in every case. The more the reaction veers away from true schizophrenia in the two directions of our diagram, either the intermediate (and/or manic-depressive) reaction or the schizoid reaction on the psychological level the better generally is the prognosis. This would confirm the experience that the so-called "other types" of schizophrenia generally tend to recover more completely than all other clinical sub-types.[6,7] In addition to manic-depressive features, clouding of consciousness (intermediate reaction type) and psychological continuity of subjective experience and clinical picture (psychological level) are the predominant characteristics of the "other types" of schizophrenia.

That the prognosis of the so-called schizoid reactions on the psychological level is much better than that of true schizophrenia is implied by the previous statements. Undoubtedly there are various kinds of combinations of reaction types. Our diagnostic diagram therefore does not imply strictly independent reaction units. However, one should always be able to determine which reaction type or types are most pronounced in the clinical picture, thus permitting certain prognostic and therapeutic conclusions.

THERAPEUTIC CONSIDERATIONS

Reactions involving the vital level will always require other than merely psychotherapeutic approach. Frequently it is practically impossible to establish any transference contact. Also, the basic happenings, as previously demonstrated, such as the decrease of vital tone in depressions and the disintegration of mental functions in schizophrenia, are beyond the reach of empathic psychological understanding. For this reason, at the present stage of development, shock therapy and occupational therapy will remain the methods of choice for both manic-depressive disease and schizophrenia. In the corresponding epileptoid reaction, medical therapy to combat either the epilepsy or the injurious agent of the symptomatic psychosis will be required.

The more the three basic reaction patterns are restricted to the psychological stratum, the more psychotherapy should prevail. Shock therapy will not suffice if there persists a basic conflict situation which requires psychotherapeutic help.

That, in view of the possible combinations of reaction types, in practice often different implements from our therapeutic armamentarium have to be employed will be readily understood.

Since the psychopathic personality is considered as inherent and resisting all available therapeutic approaches it has not been included in the discussion of prognosis and therapy.

SUMMARY

By combining differentiation between three basic reaction patterns with the concept of stratification of the personality a scheme is evolved which expresses a "natural order" of abnormal reactions and their inherent relationships. Application of this concept which stresses the importance of the state of consciousness and of the "localization" of symptoms in the stratified personality should provide a new and more satisfactory basis for diagnostic and prognostic considerations and for therapeutic conclusions.

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Electroencephalographic Findings in a Naval "Control" Group of 259 Men

Correlation With Age, Length of Service, Combat Experience and Neuropsychiatric Symptoms

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PURPOSE AND EXPLANATORY REMARKS

In order to establish a control basis for electroencephalographic interpretation in navy personnel and because of the shortage of E. E. G. data on normals a series of studies was made on 259 pharmacist's mates who were attending an independent corps school at the U. S. Naval Hospital, Portsmouth, Va. These men were on active duty and none were on sick list at the time of their examination. They had had between 18 months and 5 years naval service. Of the group, 169 had varying periods of overseas duty with and without combat experience. Of the 259 85% were between 18-30 years of age, 10% from 30-35 years and 5% from 35-40 years. Prior to examination the men filled out a questionnaire setting forth age, length of service, history of fainting spells, severe head trauma, headaches, nervousness, presence of nervous or mental disease in the family, type of service and history of tropical disease.

The examinees were in good physical health at the time of the electro-encephalographic examination. After competion of the E. E. G. examination, the E. E. G. record and the questionnaire were stapled together. Those questionnaires (59 in number) revealing evidence of a history of fainting spells, severe head trauma, headaches of long duration, nervousness, tremor, insomnia, fatigability, epilepsy or presumptive familial history of convulsions, syncopal attacks or mental disease were considered as having actual or presumptive neuropsychiatric disease and were placed in a special category which will henceforth at times be considered separately and known as Portion of Control Group with Subjective Neuro-Psychiatric Symptoms. The remainder of the men with totally negative questionnaires numbered 200 and will be considered as the Purified Control Group. No attempt was made to select comparable age groups as a basis for equitable comparison of the Purified Control Group and the Portion of Control Group giving Subjective Neuro-Psychiatric Symptomatology. However, age distribution in both groups were strikingly similar so that disparity in findings could not be attributed to age differences.

It is emphasized that the two series were separated on the basis of the men's answers to the questionnaire and not on the basis of their E. E. G. findings.

ELECTROENCEPHALOGRAPHIC TECHNIQUE

The electrical activity of the right and left frontal, parietal and occipital cortex was recorded with a 6-channel electroencephalograph. All records were made with monopolar leads. The indifferent electrode was formed by interconnecting the two ear leads. Electrodes were applied to the scalp using the method described by Gibbs.[1] Records were taken with the patient lying on a table in a shielded cage. Cortical activity was recorded for at least ten minutes on each subject. Two minutes were allowed for hyperventilation and 2-3 minutes were allowed for recovery.

METHOD OF ELECTROENCEPHALOGRAPHIC INTERPRETATION

Gibbs' classification of E. E. G. records[2] was used throughout with the following modification: all paroxysmal tracings (petit mal, psychomotor, grand mal, spikes) and S-2 and F-2 tracings were classified as GREATLY ABNORMAL. The F-1 and S-1 tracings were classified as SLIGHTLY ABNORMAL.[3] All activity in the range of 8 to 13.5 per second was classified as NORMAL. Brief runs of slow activity in the S-1 and S-2 groups that persisted for less than 15 seconds after cessation of 2 minutes hyperventilation were discounted if the tracing was normal before hyperventilation and if the abnormalities did not recur after hyperventilation. All tracings with paroxysmal types of waves were placed in the GREATLY ABNORMAL group irrespective of whether they occurred before or after hyperventilation. Abnormalities that occurred *during* the period of hyperventilation were not considered unless they were of the "spike and dome" type. Complicating artifact due to deep breathing, body movements, muscle potentials etc. appeared so often as to make this unreliable, especially in the interpretation of fast and "spiky" types of activity. In interpretation of all tracings mention was made as to whether the abnormalities were focal or non-focal in type. The whole record was carefully reviewed and random wave counts made on at least 40 seconds of record before and after hyperventilation.

Since certain workers differ in regard to E. E. G. interpretation using monopolar and bipolar technique (especially in the amount of abnormality noted after hyperventilation) it should be noted that all interpretation of this series was obtained from E. E. G. records derived by the use of monopolar technique as described above.

RESULTS

Analysis of the E. E. G. records of the total group of 259 men disclosed that 20 or 7.7% had greatly abnormal records (none of which was of the paroxysmal type); (See TABLE II.) 36 or 13.9% had slightly abnormal records and 203 or 78.4% of the records fell within normal limits.

Of this group (259) 101 men had been overseas and had had combat experience; 10 or 9.9% of these had greatly abnormal records (none of the paroxysmal type); 18 or 17.8% had slightly abnormal E. E. G. records and 73 or 72.3% were within normal limits.

Out of the total, 151 men had either not had foreign duty or had had foreign duty without combat. Eight or 5.5% had greatly abnormal E. E. G. records (none of which was of the paroxysmal type), 18 or 11.5% had slightly abnormal records and the remaining 125 or 83% of this group had E. E. G. records that fell within normal limits.

The type of duty of seven of the total group was unknown.

TABLES I, II, III and GRAPHS I and II are self-explanatory.

TABLE I.

Comparison of E. E. G. Findings in Combined Combat and Non-Combat Groups Subdivided Into Purified Control Group and Portion of Control Group That Had Neuropsychiatric Symptomatology.

Group	No.	Greatly Abnormal E.E.G.		Slightly Abnormal E.E.G.		Normal E.E.G.	
Non-Combat Purified Controls	122	4	(3.3%)	10	(8.2%)	108	(88.5%)
Non-Combat Controls With NP Symptoms	29	4	(13.8%)	8	(27.6%)	17	(58.6%)
Total Non-Combat Group	151	8	(5.3%)	18	(11.9%)	125	(82.6%)
Combat Purified Controls	71	6	(8.5%)	9	(12.7%)	56	(78.9%)
Combat Controls With NP Symptoms	30	4	(13.3%)	9	(30.0%)	17	(56.7%)
Total Combat Group	101	10	(9.9%)	18	(17.8%)	73	(72.3%)

TABLE II

Table II Shows the Age Distribution of the Purified Control Group and of the Portion of the Control Group That Had Neuropsychiatric Symptomatology.

(A) AGE DISTRIBUTION OF PURIFIED CONTROL GROUP (YEARS)

Group	No.	17-20 No.	21-25 No.	26-30 No.	31-35 No.	36-40 No.
Normal E. E. G.	165	15 (9.1%)	86 (52.1%)	34 (20.6%)	19 (11.5%)	11 (6.7%)
Abnormal E. E. G.	29	2 (6.9%)	17 (58.6%)	6 (20.7%)	4 (13.8%)	0 (0.0%)
Total Purified Control Group	194	17 (8.8%)	103 (53.1%)	40 (20.6%)	23 (11.9%)	11 (5.7%)
Unknown	6					

(B) AGE DISTRIBUTION OF PORTION OF CONTROL GROUP WITH NEUROPSYCHIATRIC SYMPTOMS (YEARS)

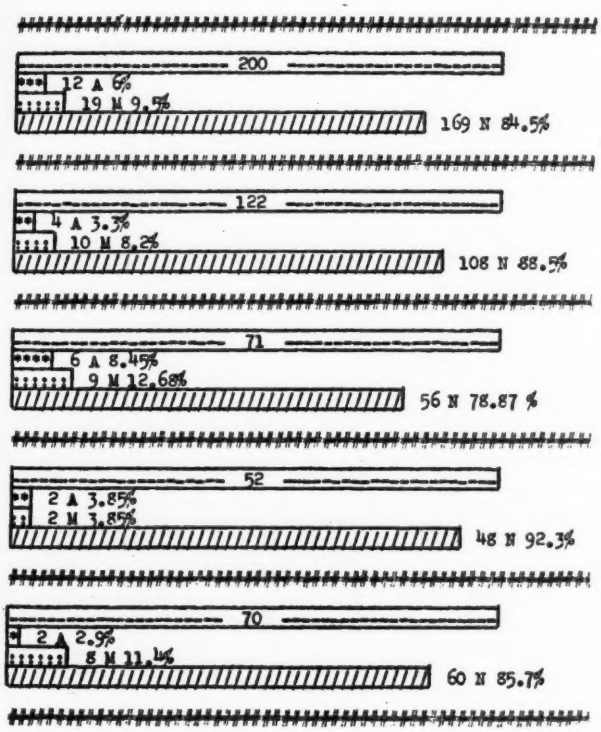
Normal E. E. G.	34	4 (11.7%)	19 (55.9%)	6 (17.6%)	2 (5.9%)	3 (8.8%)
Abnormal E. E. G.	25	1 (4.0%)	15 (60.0%)	5 (20.0%)	2 (8.0%)	2 (8.0%)
Total Portion of Control Group With NP Symptoms	59	5 (8.5%)	34 (57.6%)	11 (18.6%)	4 (6.8%)	5 (8.5%)

TABLE III

Distribution of the Types of E. E. G. Abnormality.

	Total Number of Subjects	Normal E.E.G.	Abnormal E.E.G.	Type of E.E.G. Abnormality (Gibbs' Classification) S-1	F-1	S-1 & F-1	S-2	F-2	S-2 & F-2
Purified Control Group	200	169	31	9	2	8	11	1	0
Portion of Control Group With NP Symptoms	59	34	25	4	4	9	6	0	0

GRAPH I.



Total Purified Control Group

122 Cases of Purified Control Group who were in no combat but had 18 months or more of service.

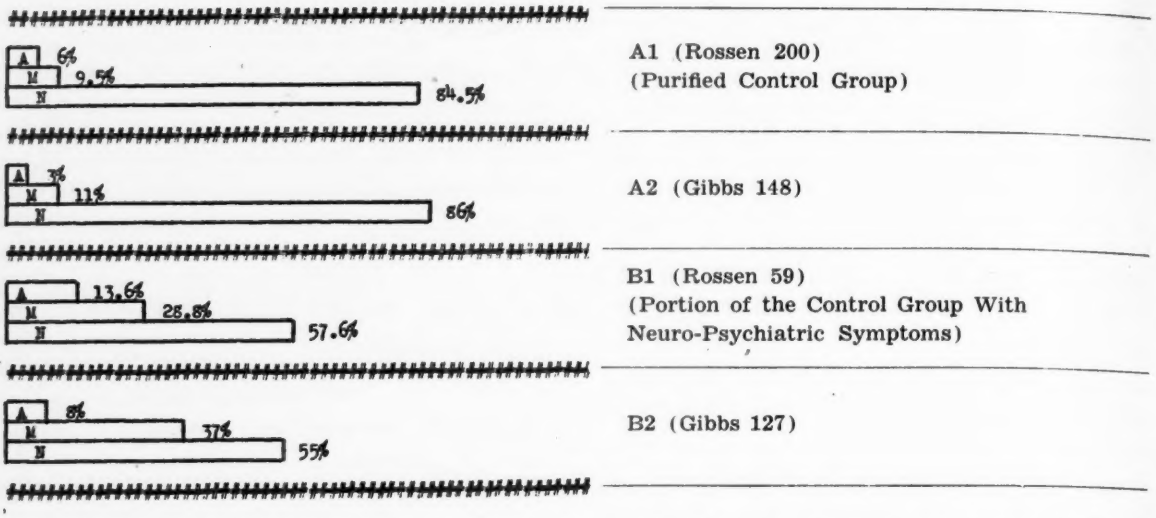
71 Cases of Purified Control Group who had seen combat in one or more campaigns.

52 Cases of Purified Control Group who had overseas duty and over 18 months of service but no combat.

70 Cases of Purified Control Group who have had no overseas duty.

E. E. G. Interpretation: A—Greatly Abnormal; M—Slightly Abnormal; N—Normal.

GRAPH II.



Comparison of Distribution of E. E. G. Findings in Selected Groups of Young Men of Military Age.

Groups A1 and A2 with no history of severe head injury or neuropsychiatric disorder.

Group B1 and B2 with positive history of severe head injury or neuropsychiatric disorder. (Gibbs' Group, 275 candidates for military service; Rossen's Group, 259 pharmacist's mates attending school, all of whoc had from 18 months to 5 years service.

E. E. G. Interpretation: A—Greatly Abnormal; M—Slightly Abnormal; N—Normal.

COMMENT AND DISCUSSION

From the data at hand it would appear that the control group of 259 was somewhat unique as 59 men with symptoms of neuropsychiatric disease were able to withstand strenuous military life for from 18 months to 5 years. It may be significant that these 59, however, did show the highest E. E. G. abnormality when compared with the Purified Control Group of 200 men who voiced no neuropsychiatric symptoms. Of the Purified Control Group, 21% showed E. E. G. abnormality as compared with 11.5% of the same group who were not in combat. This difference is probably of little significance since civilian control groups such as studied by Hoefer[4] were found to run up to 15% of abnormality. In the Portion of the Control Group that did show Neuropsychiatric Symptomatology and who were in combat, the percentage of E. E. G. abnormality ran much higher (43.3%). This number is about twice as high as found in the Purified Control Group that had been in combat. However, a comparison of the Portion of Control Group who had Neuropsychiatric Symptoms and who had not been in combat reveals E. E. G. abnormality of 41.4%. Since, of the 30 men who saw combat, 43.3% had E.E.G. abnormality as compared with 41.4% E. E. G. abnormality in the 29 men who were not in combat it would appear that pre-existing personality disorder and inherent cerebral dysrhythmia were the most important factors in the production of the abnormal E. E. G. and that the abnormal E. E. G. was not due to the influence of their combat experience.

When the group of 71 men who saw combat is removed from the Purified Control Group the percentage of abnormal E. E. G. decreases but there appears to be no significant change in the E. E. G. tracings that were slightly abnormal. A comparison of this "Control Series" with those of other workers[2,4,5,6] revealed the following: Gibbs'[2] control series of 1000 adults contained slightly less than 1% of E. E. G. tracings of a paroxysmal type. No paroxysmal tracings were found in our series. His S-2 and F-2 tracings, corresponding to our greatly abnormals, numbered just over 1%. In this

series when the combat group was removed the percentage came to 3.3 and when the combat group was retained, 6%. Gibbs' S-1 and F-1 tracings amounted to 13.8% (slightly abnormal) as compared with 9.5% for our series. The greatly abnormal tracings in the group of inductees with no neuropsychiatric symptoms analyzed by Harty, Gibbs and Gibbs[5] ran somewhat higher (about 3%) but this group was numerically much smaller than Gibbs'[2] large series. (See GRAPH II.) Greenblatt's control series of 240[6] contained about 10% of E. E. G. abnormalities while Hoefer[4] found 15% of unselected normal subjects with slightly or moderately abnormal brain patterns.

Although the Portion of Control Group with Neuro-Psychiatric Eymptoms is small, a comparison of it with Harty's, Gibbs' and Gibbs'[5] reject group (those with neuropsychiatric symptoms) revealed a marked similarity. (See GRAPH II.) In agreement with Heppenstall *et al.*[7] it would appear that E. E. G. abnormality alone is not an adequate reason for rejection for military service because the data presented showed that 20% of the total group were able to carry on for 1½ to 5 years and participate in one or more campaigns in spite of their neuropsychiatric symptoms and abnormal E. E. G. However, there does appear to be a relationship between E. E. G. abnormality and neuropsychiatric symptoms other than those of a convulsive disorder. To what degree combat experience is a factor cannot be determined in so small a group without further investigation but there appears to be some difference between the E. E. G. abnormalities in the combat group as compared with the non-combat group in those persons who volunteered no neuropsychiatric symptoms. Nervousness, headache, sweating and tremor of the hads were the most common symptoms of the Portion of Control Group with Neuro-Psychiatric Symptoms and occurred in over 70%. It is interesting that insomnia occurred only in about 12% of the Portion of Control Group with Neuropsychiatric Symptoms.

CONCLUSIONS

Of a group of 259 men having had from 18 months to 5 years naval service as Pharmacist's Mates, some of whom had experienced foreign and combat duty but who were not on the sick list:

A. The lowest incidence of greatly abnormal and slightly abnormal electroencephalograms appeared in the Purified Control Group (those who had no combat experience and who voiced no neuropsychiatric complaints). The percentage of abnormality was 11.5% and was in agreement with findings of other workers.

B. There was an increase in E. E. G. abnormality in those men who saw combat but who did not voice any neuropsychiatric complaints. However, the difference was not significant and the percentage of abnormality could be considered within normal limits when subjected to statistical analysis.

C. There was the highest incidence of E. E. G. abnormalities in those men who voiced neuropsychiatric complaints and who had been in combat but these abnormalities were not essentially different from a group of men who voiced neuropsychiatric complaints but who had seen no combat.

D. The age distribution of the Purified Control Group and the Portion of Control Group with Neuropsychiatric Symptoms was quite similar so that the disparity in findings could not be attributed to age differences.

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Psycho-Physiological Background of Pain and Its Psychologic Treatment

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There are very few problems in medicine in which pain in some form or other does not enter into consideration. Although in ordinary clinical practise pain is by far the commonest presenting complaint, the essential nature and characteristics of painful sensations and their physiological and psychological subtrates are only imperfectly understood, and it is at least partially for this reason that the treatment of many painful conditions is so unsatisfactory. In spite of the tendency in recent years to attribute any obscure or puzzling clinical picture to functional or non-organic causes, from a practical point of view it is still true that we must understand all components of a dysfunction including the organic before we can give psychological factors the importance they deserve. If a pain is the result of an hysterical conversion or if it results from the autonomic concomitants of an anxiety state it should certainly be handled psychotherapeutically. However, psychotherapy will be handicapped and will fail if it is used as the sole approach in the treatment of conditions in which psychological factors are not basic or primary. In order to properly apply psychological treatment to painful states, it is essential that what is known of their psychological and physiological concomitants be understood in their full complexity so that phenomena which have a demonstrated structural basis should not be attacked on a symbolic level and conversely that psychogenic mechanisms should not be interpreted anatomically.

To illustrate the complexity of the situation and the many elaborations which enter into it, the simplest possible example of of painful stimulus, such as the prick of a pin on the skin, will be discussed at its various levels of integration. Regarded uncritically and naively what happens in such an example can be explained in terms of activation of a pain receptor in the skin with the resulting impulse being transmitted along the nerve through the posterior root into the cord where the first synapse is made in the posterior gray column. The impulse is then carried to the opposite side of the cord and ascends through the cord, medulla, pons and midbrain in the lateral spinothalamic tract to make a second synapse in the lateral portion of the ventral nucleus of the thalamus whence the impulse is relayed to the post-central parietal cortex where it is recorded and localized as a painful sensation.

The first step in this postulated chain of events depends on what has been known as "the law of specific nerve energies." This assumes that there are four primary sensations to be derived from the skin. Each of these, touch, pain, heat and cold is subserved by specific receptors adapted to transmit only one kind of sensory impulse. In the case of pain the receptors are the free nerve endings and plexuses which ramify deep in the dermal and epidermal layers of the skin. However, as Sheehan[1] has pointed out there are all sorts of gradations between the va-

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rious types of receptors and attempts to establish an exact correlation between a specific type of ending and a specific ending have not been entirely successful. The work of Tower[2] has suggested that each individual end-organ is not a specific unit but should be regarded as one terminal of a complex unit, the sensory neuron whose endings ramify through its area of peripheral distribution. The stimulation of any part of this large unit initiates impulses which spread throughout the unit to condition each of its many parts. In addition, no matter how minimal the stimulus, more than one of these sensory neuron units and consequently many types of receptors are activated. Thus what is registered centrally in even the simplest case is a pattern of excitation from which are abstracted the sensations described as touch, pain and temperature.

The exhaustive researches of Sir Thomas Lewis[3] should be mentioned at this point since they bear on the question of prolonged local pain and the related one of hyperalgesia. According to Lewis, injury to the skin from whatever cause is associated with the liberation of a relatively stable chemical substance which diffuses through the tissue spaces and renders the pain endings hyperexcitable. A special system of "nocifensor" nerves has been postulated by Lewis to account for the changes in the skin which leads to the elaboration of the pain threshold lowering metabolites. The mechanism is useful in explaining the painful states associated with vasomotor disturbances, asphyxia, frost bite and mechanical injuries. An extreme example is the "immersion foot" syndrome with marked loss of fluid into the tissue spaces seen in sailors adrift in open boats or rafts. These researches of Lewis' illustrate in a concrete way how painful conditions such as certain vasomotor syndromes and the minor causalgias which have sometimes been regarded as entirely functional may be better understood and thus more adequately treated by an appreciation of all the factors entering into their genesis.

To return to the painful impulse which has been left knocking at the portals of perception, it must next be transmitted along an afferent nerve to the spinal cord. The nerve fibers composing such a nerve have been divided on the basis of their size into A, B, and C groups. The fibers of group A are myelinated, vary in size from 1 to 20 microns in diameter and conduct at a speed ranging from 5 to 100 meters per second. Group C includes unmyelinated and the smallest of the myelinated fibers and the conduction rate is less than 2 meters per second. Group B is intermediate and its fibers which conduct at a speed between 3 and 14 meters per second are all less than 3 microns in size. Pain impulses may be carried in the smaller sized fibers of Group A, those of Group B, as well as C. Thus pain impulses may vary in speed from a half meter to some 30 meters a second. This is the explanation for the "fast" and "slow" pain experienced by anyone who has bumped his shins. The initial sharp and localized pain is succeeded after a perceptible interval by the more diffiuse and poorly localized "slow" pain. In some cases of tabes dorsalis apparently due to a selective lesion of the larger fibers of the posterior roots only the "slow" pain is felt so that pain perception is delayed.

On reaching the central nervous system, the impulse is subjected to continuous modification and integration. This action occurs at various levels and in various ways. At the level of the spinal cord the previously undifferentiated stimulus is acted on by the pool of internuncial neurons which consists of a group of spinal cord neurons interposed between the afferent and efferent units taking part in reflex activity. Sir Henry Head[4] believed that these neurons which are located in the posterior horns are capable of either facilitating or inhibiting the sensory impulse before it reaches the secondary neuron and that they are actively engaged in integrative functions affecting all normal sensory impulses. He said "The afferent impressions produced by the actions of an external stimulus are highly complex and are subjected to the integrative action of the central nervous system before they can become fitted to subserve sensation. Qualities such as pain, heat and cold are abstracted from the physical response and spoken of as

'primary sensations . . .'—but a 'primary sensation' is an abstraction."[5]

Under normal conditions the central activity tends to favor the transmission of the discriminative sensibilities and to inhibit pain impulses thus aiding in learning processes and increasing the efficiency of the individual. However, under abnormal conditions such as in certain lesions of the posterior horns or central gray matter, or with continued bombardment of the CNS by noxious peripheral stimuli, the discriminatory impulses are derailed and the pain pathways opened up widely. The fact that the central effector organs for pain are thus influenced by the functional condition of the other parts of the nervous system gives a partial explanation of why pain is felt so much more acutely and lastingly in anxious, tense, apprehensive people whose entire nervous system can be considered to be in a state of hyper-irritability.

After it has ascended in the spinothalamic tract and possibly also in a supplementary archaic relay chain of short neurons, the painful impulse at length reaches the thalamus and perception. Although it is generally accepted that painful sensations are registered primarily at this level there is undoubtedly a close functional relationship with the cerebral cortex and in the intact human being the two act harmoniously as a unit. The peculiar burning, poorly localized pain and hyperalgesia of the thalamic syndrome has been ascribed to a lesion of the cortico thalamic projection whereby the inhibitory influence exerted by the cortex over thalamic responses was removed. However, the fact that the syndrome is more likely to occur with thalamic than with cortical lesions is against this view as is the fact that similar hyperalgesic states may occur as a result of central lesions occurring at lower levels. In addition, two recent clinical surgical observations lead to very different conclusions. DeGutierrez-Mahoney has relieved a case of phantom limb pain by excising a portion of the patient's sensory cortex. In cases of long lasting and intractable pain in which the affective and therefore presumably the thalamic element is considerable, dramatic improvement has resulted from the operation of prefrontal lobotomy whereby the fronto thalamic fibers are bilaterally severed.[7] This result would tend to indicate that at least in these cases, the role of the cortex has not been to hold in check a primitive and unstrained thalamus but rather, by disconnecting the influence of the frontal lobes with all their psychic elaborations of fear and introspective anguish, to allow the intensity of the painful sensations to fall to their relatively bearable normal level.

From this rapid review of some of the psycho physiologic aspects of painful sensations it can be seen that the opportunities for organic-functional interplay are infinite and that in every case both types of factors are more or less important and must be dealt with for treatment to be effective.

In considering the actual methods of psychological treatment of painful conditions it is necessary to consider first cases which are predominantly organic and which are underlain by definite and gross pathological processes such as malignant tumors. In these cases psychologic treatment can be no more than a secondary although very useful adjunct to the main therapeutic attack designed to eradicate the causative agent or process. However, when one considers the multiplicity of factors playing on the painful impulse between its origin and its registration in consciousness it is evident that the patient's basic personality and his attitude towards his disease, his future and his physician, can constitute an important segment of his reaction. In this connection nothing is more vital, as it is indeed in all psychotherapy, than the nature of the interpersonal relationship between patient and doctor. A sufferer from organic pain is illy served by a physician who communicates by his attitude doubt, fear and uncertainty or by one who over-identifies with the patient and is so excessively solicitous and sympathetic that secondary emotional problems and fears are raised. The middle course characterized by genuine but not sentimental interest and by a calm air of decision and purpose will be most successful in diminishing the patient's pain to its irreducible organic nucleus. The relatively mas-

terful and dominant physician of the type described in Sir William Osler's "Aequanimitas" will by his attitude encourage the normal and relaxing emotional dependency of illness. An essential component of the doctor's attitude is sufficient emotional security and confidence in his own judgment so that the patient is not forced into the exhausting and tension provoking necessity of making choices for which he does not possess the requisite background of knowledge.

It may be felt that this description of an attitude does not constitute psychotherapy but it is acually one of the most vital components of any attempt to psychologically influence symptoms. The victim of a malignant process cannot be talked out of his pain but he can be helped by the doctor who respects both himself and his patient, to bear it. In other conditions in which the pain of an organic condition by initiating certain vasomotor reflexes, has a reciprocal effect in hindering the resolution and healing of the causative lesion, proper psychological management may break the vicious circle thus set up, and actually hasten a cure.

The manifold pains, aches and discomforts which occur without important original structural lesions and in association with abnormal psychopathologic backgrounds are of course the proper province of psychotherapy. However, it should be emphasized as strongly as possible that obscurity is not of itself synonymous with psychogenicity. To consider a pain, or for that matter, any other somatic symptom, to be functional simply because no clear-cut organic explanation is immediately available is entirely fallacious and will have the effect in many cases of making useless conscientious psychotherapeutic endeavors. A bodily symptom of mental or emotional origin will in every instance in which careful psychologic exploration is carried out, be found to rest on demonstrable psychopathologic foundations. Such exploration is essential not only for diagnostic purposes but because a knowledge of the conflicts from which the symptom springs and their severity forms an indispensable prerequisite for planning the type and technique of the therapeutic attack.

Another and more obvious obstacle to the proper care of patients whose pains rest on an anxiety or conversion background lies in the failure to recognize their psychogenic nature. The indefatigable search for structural causes for a non-organic condition, the emphasis on minor and insignificant pathological curiosities, and the wearisome repetition of empiric medicinal remedies in the hope that something will work are all common medical sins. They have the unfortunate effect of not only denying the patient the type of treatment he needs but of giving his neurosis time and opportunity to harden and become fixed to the point at which psychotherapy, if it is finally resorted to, is very badly handicapped.

Among pains of psychological origin an important distinction should be made between the hysterical conversion phenomena and those occurring in the anxiety states. In the former the pain is a direct translation from unconscious wishes or fantasies into the "body language" and can be understood on the verbal-symbolic level. In the anxiety states, somatic symptoms represent the physiological concomitant of the anxiety. Thus the tension-anxiety headache is secondary to spasm of the scalp and cervical musculature which results from the flooding of the patient's nervous system by impulses to which he is unable to give adequate external expression.

There is, of course, no specific psychotherapy for psychogenic pains or for any of the other single symptoms which form individual manifestations of an improperly functioning personality. The particular approach depends on the severity and nature of the underlying psychopathology. The various exploratory and uncovering techniques are time consuming and difficult and are properly the province of the psychiatric specialist. However, there are many so-called rational aids that can be employed by any physician depending on his interest and the time at his disposal. The rationale of their use has been summarized by Fenichel.[8] "The ventilation of unclear worries alone brings

relief because the ego can face verbalized ideas better than unclear emotional sensations. The very fact that a doctor spends time, interest and sympathy on a patient's worries may not only be 'transference' of a past situation but also a very original and substantial relief for lonesome persons who have no friends to talk to, or for persons who have been misunderstood or scolded for their difficulties up to now. Information about emotional, and especially sexual matters, may help to set at ease excited souls. Further, if a patient sees connection between hitherto unconnected symptoms, worries, or parts of his personality, if he is helped to detect general patterns of behavior behind concrete actions, and if he even detects the relationship of such patterns to one another, all this certainly makes his ego relatively stronger in its relation to the deeper forces within his personality. . . . The effectiveness of these rational methods can be further increased by advice that may lead the patient away from unnecessarily tempting or exciting situations, or may push him towards some reassuring position."

The efficacy of certain medicinal remedies for painful conditions may depend on the fact that they are administered by a physician with a warm and confident personality towards whom the patient finds it easy to establish a relationship of trust and reliance.

To sum up, the successful treatment of pain requires a knowledge of the complexities of the problem both from the physiological and psychodynamic viewpoints and the willingness to spend time and effort in ameliorating it by whatever means are available. In most cases, just what is done is less important than how much is understood and in what manner whatever is done is carried out.

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Hazards of Curarization Before Electroshock

Case Reports

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In the eight years since the introduction of curare as an agent for the modification of the convulsive seizure in metrazol and electroshock therapies,[1,2] the incidence of traumatic complications has without doubt been greatly reduced. At what cost in increased hazard this result has been achieved has been of growing concern to the less prejudiced enthusiasts of the method. It is clear and beyond denial that untoward reactions of all degrees may follow even the most careful use of this drug. It is probable that these are of several types. Peripheral muscular paralysis leading to sudden cessation of respiratory movement is widely referred to as rare occurrence; subclinical myasthenia gravis is described by Bennett and Cash[3] and subsequent authors as producing extreme sensitivity to the drug with rapid

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peripheral paralysis; evidence has been clearly presented by Fegler[4] and Fegler[5] of the possibility of *central* respiratory paralysis; the appearance of a form of vagal hyperactivity in the presence of both electric shock and a curare preparation is described by Altschule and Tillotson[6]; this will be discussed in reference to the patients to be presented. Except in the case of subclinical myasthenia gravis, for which Bennett and Cash[3] have devised a method of pre-treatment testing, there are no successful methods for the prediction of the other types of untoward reaction to curare. The cases to be presented exemplify this latter group.

CASE HISTORIES

Case 1. Mrs. J. A., a 53-year-old white widow, was admitted November 11, 1945, having been increasingly depressed for two years. There had been one previous hospitalization in 1928 for similar reasons. At this time, she had recovered after a three months' hospital stay, and was symptom-free until the onset of the present episode. She was classified as manic-depressive, depressed.

Physical examination upon admission showed her to be moderately obese, of pyknic build. She had a soft systolic murmur at the cardiac base, and variable hypertension reaching 170 mm. systolic on one occasion. Cardiac fluoroscopy and electrocardiogram were within normal limits. There were no significant neurological findings. Urinalysis and blood Hinton test were normal.

Electroshock treatments were begun on the fifteenth day after admission and continued at two per week. Following the fourth shock, she was found by X-ray to have an avulsion fracture of the distal part of the humerus. The use of curare ("Intocostrin") was therefore planned for the fifth treatment.

The dose was calculated on the basis of 0.5 units (standardized by the manufacturer by biological assay) per pound of body weight less ten percent for the initial treatment, yielding a total of 80 units in 4.0 cc. solution. The patient was extremely agitated before treatment, and expressed the conviction that the process would prove fatal. The first 20 units were injected through a wrist vein in 30 seconds, and a negligible amount in the next 30 seconds. At this time, no untoward signs were evident. In the next one minute, 40 seconds, she received 25 units more, making a total of 45 units in two minutes, 40 seconds. At this moment injection was discontinued because respiratory efforts became feeble and ineffective, deep cyanosis appeared, and there seemed to be some degree of obstruction to the airway. The patient thrashed violently about for a few seconds. Veins had collapsed and an attempt to inject prostigmine was unsuccessful. She was placed in the prone position, where artificial respiration was observed to be mechanically effective, although the cyanosis was unrelieved. In addition, she was pulseless. Two minutes later, artificial respiration was interrupted long enough to make an intracardiac injection of 1.0 cc. of prostigmine 1:1000, accompanied by coramine intramuscularly. Four minutes after this, the heart beat was not audible, and more coramine was injected into the heart. After a further five-minute period of artificial respiration, during which there was no change in her condition, she was given a second intracardiac injection of prostigmine, accompanied by lobeline intramuscularly. Artificial respiration was continued for a total of 30 minutes. At this time efforts were abandoned, since the heart beat had not returned.

A complete postmortem examination was singularly unrevealing. The cardiovascular system was entirely normal except for slight calcification in the walls of the left main coronary artery, without narrowing or thrombosis. No emboli were found after an extensive search. The lungs showed a moderate degree of edema in microscopic section, with no abnormality of their vascular system. Examination of the brain showed no significant departure from normal.

It seems unlikely that death could be explained on the basis of a paralytic phenomenon alone, such as peripheral respiratory paralysis, and there were no signs of any kind to suggest the presence of myasthenia gravis. Apnoea and deep cyanosis would

have in these cases resulted, but active and mechanically effective artificial respiration should have maintained life until the effects of even the delayed administration of prostigmine became evident. The same might be said for central respiratory paralysis. While it is true that spontaneous respiratory movements were absent and there was even some obstruction of the airway, the most dramatic aspect of the picture was the sudden cardiovascular collapse. For this reason, we have ascribed death to cardiac failure of obscure origin.

Some light may be shed by the theory recently proposed by Altschule and Tillotson,[6] who present two cases. In one, the seizure after curarization was followed by brief apnoea, slow, labored, wheezing respiration, marked brady-cardia and cyanosis. The patient recovered completely. In the second, initial recovery was followed by prolonged apnoea, loss of pulse, then bradycardia and death. The authors cite experimental evidence that cholinergic (vagal) activity induced by electroshock is balanced by adrenergic discharge, but that "Intocostrin" contains substances other than d-tubocurarine (the essential alkaloid), with demonstrated anticholinesterase activity. They believe that the cholinergic-adrenergic balance in response to electroshock may be upset by constituents of "Intocostrin," resulting in exaggerated vagal activity not affected by prostigmine or stimulants. They give strong corroborative evidence in the electrocardiographic observation of periods of post-convulsive asystole in both cases.

Although the patient above described did not receive the electroshock, one may speculate whether, under conditions of extreme agitation and apprehension, adrenergic discharge may be suddenly over-balanced by vagal response to the substances mentioned by Altschule and Tillotson. Complete asystole might then follow the moderate asphyxia of partial respiratory paralysis or pharyngeal obstruction, while these factors alone would not be fatal in result. The lack of a better explanation is only further evidence of the difficulty of the problem involved.

Case 2. C. B., a 34-year-old white man, was admitted January 6, 1945, for his first episode of mental illness of a month's duration. He was tense, withdrawn and suspicious, expressing vivid paranoid ideas, with some evidence of a suicidal trend. He was diagnosed paranoid schizophrenia.

There were no findings of note in physical and neurological examination. Blood Hinton test was negative, and the electrocardiogram was within normal limits.

Electroshock treatments were begun two and a half weeks after admission, given twice a week. After the second treatment he was shown by X-ray to have a compression fracture of the fourth dorsal vertebra, so it was planned to use curare thereafter.

The dose of curare was calculated as in Case 1, also yielding 80 units in 4.0 cc. Immediately before treatment the patient was frankly scared. He was pale and trembling. He paced the floor. He could not be successfully reassured. The entire dose was injected intravenously at 1.0 cc. per minute, in a total of four minutes. During the one minute pause before the current was passed he was gagging slightly, but was not obstructed. Then, after a 45 second major seizure, he was deeply cyanotic and completely apnoeic. One cc. of prostigmine 1:2000 was administered immediately, but without effect. Artificial respiration was begun and carried on actively for six minutes before any sign of spontaneous breathing movement appeared. During this time he had a death-like pallor and was comatose, and the only sign of life was the palpable heart beat. (Unfortunately the pulse rate was not recorded.) For several minutes after spontaneous breathing returned, it was slow, labored, and wheezing in character. He ultimately recovered completely.

Subsequent treatments, using a six per cent reduction in dose of curare, were followed by some cyanosis and brief apnoea, but the patient responded without complications to the immediate administration of prostigmine and artificial respiration. He was obviously less frightened before these later treatments, no longer pacing about in great agitation.

It must be noted that the patient suffered no untoward reaction from two electroshock

treatments without curare, except for the fracture, and none from the curare alone, during the five minutes after the injection began. The prolonged apnoea, cyanosis, palor and comatose state were, therefore, the result of curare *combined with* electroshock. The clinical picture is thus closely similar to that described by Altschule and Tillotson,[6] and so might be explained by their theory. There is further evidence of this in the patient's failure to respond to prostigmine. It is curious that recovery from later treatments was so much better, although the dose of curare was reduced by so small a proportion. The only factor which appeared to change markedly was the apprehension, so one is again inclined to speculate whether severe fright altered the adrenergic-cholinergic balance, to assist curare in the production of post-convulsive vagal hyperactivity, as described by Altschule and Tillotson.[6]

Case 3. A.G.S., a 41-year-old white man, was admitted for the fourth time in four years on March 3, 1947, for a recurrence of paranoid symptoms, associated with considerable tenseness, anxiety and fearfulness.

Physical and neurological examinations were within normal limits, and blood Hinton, urinalysis and electrocardiogram were all normal.

Electroshock treatments were planned with the use of curare because while receiving metrazol convulsive treatments under insulin comas in June, 1943, he had suffered a compression fracture of a dorsal vertebra. Based as before upon body weight, the calculated dose of curare was 100 units in 5.0 cc. Both because of his symptoms and the memory of his previous treatments, the patient was extremely apprehensive, admitted it, and could not be reassured. The injection was begun at the rate of 1.0 cc. per minute. After he had received 3.5 cc. the patient suddenly became panicky and complained of inability to breathe. He was in no way obstructed, so the electroshock was given, after stopping the injection. After a 30 second seizure, he was deeply cyanotic and made no spontaneous breathing movements. The pulse was moderately full, the rate about 40. Artificial respiration was begun immediately and 1.0 cc. of prostigmine 1:2000 was given intravenously. Because there was no change in the patient's condition after one minute, 1.5 cc. of coramine was injected directly into the left ventricle of the heart and oxygen by mask was administered with continued artificial respiration. Almost immediately, the pulse rate increased to about 50. Approximately eight minutes later, spontaneous breathing movements began, but for 10 minutes more, breathing was extremely labored and wheezing in character. The patient regained consciousness in 20 minutes from the time of the shock. He felt "groggy" the remainder of the day, but had completely recovered in 24 hours. The softening effect produced by the curare was apparently negligible, and in view of the narrow escape described, treatments were continued thereafter without the drug. No further injuries or complications were encountered in the course of six more treatments.

The close similarity between this and the last case is apparent, and the same explanation for the reaction is applicable. In addition to these two cases one more of the same clinical pattern (including the apprehension before treatment) and the same outcome was encountered in 1945. Because of its great similarity, the details will not be reviewed here. It must again be emphasized that as in the first case, there was no evidence whatsoever of myasthenia gravis in any of the last three cases described.

CONCLUSIONS

In the five years since electroshock was introduced at this hospital, 463 patients have been so treated with an average of eight treatments each—a total of 3700 treatments. Of these 16 (3.5% of the patients) suffered some form of injury as a result of treatment. However, 11 injuries were muscular or ligamentous with negative X-rays, and only five (1.1% of the patients) had skeletal fractures: three were compression fractures of dorsal vertebrae and two were fractures of the humerus. In all cases adequate treatment was followed by complete recovery without malformation or malfunction. In all cases but those of the frac-

tured humerus, treatment was continued two weeks after injury, using curare. In those, treatment was successfully concluded some months later, also with curare.

These figures are presented to implement the conclusion that in view of the unpredictable occurrence of untoward reactions to curare, exemplified by the cases presented, the routine use of this drug to prevent injuries is not yet indicated. One patient has died as the direct result of curarization, three others have narrowly escaped, but no patients have died as the result of skeletal injury, nor even suffered lasting ill effects.

Our conclusions thus differ from those of Bennett, who states,[7] "The erroneous opinion still exists that curare increases the hazard of treatment. This is not true, as shown by the fact that over 100,000 curare-metrazol or electroshock treatments have been given, with but one reported fatality; and in that case neither proper artificial respiration nor prostigmine was used." Bennett also states with Engle[8] in a later paper, "It is not true that curare is a cardiac and respiratory depressant." The conclusion is not consistent with our observations of dramatic cardiovascular collapse and marked bradycardia, which were also observed by Altschule and Tillotson,[6] nor with Fegler's work[4] indicating a central respiratory depressant action of curare.

Faced with these results, we have been impressed with the unpredictability of curare reactions as well as by the obvious dangers implied. Aside from the relatively rare occurrence of clinically undetected myasthenia gravis, which may be discovered by the method of Bennett and Cash,[3] these untoward reactions are not sufficiently understood to be safely predicted. Altschule and Tillotson[6] have suggested the possibility of eliminating the type of difficulty they describe by the use of purified d-tubocurarine. It is our feeling that as soon as this substance becomes generally available, it should replace cruder preparations whose actions are less well understood. Until this time, however, the greatest caution in the use of curare would seem necessary. To this end, we have adopted certain precautionary measures.

Calculating the dose as described in the case presentations, the injection is administered at the carefully observed rate of 1.0 cc. (20 units) per minute. Any signs of laryngeal or pharyngeal obstruction are immediately met by discontinuing the injection and giving prostigmine intravenously. Oxygen with a mask is kept immediately at hand. After the electroshock treatment, prostigmine is injected at the moment of cessation of convulsive movements, as well as coramine intramuscularly. Trained personnel are also at hand for the immediate institution of artificial respiration, which is carried on routinely until full, spontaneous breathing is established. Of paramount importance is the pre-treatment interview with the patient, in which the degree of apprehension is evaluated and reassurance given.

SUMMARY

Three cases of untoward reaction to the use of curare before electroshock treatment are presented, one with a fatal outcome and the others presumed near fatalities.

A possible explanation for the reactions is discussed, the inherent dangers of curarization are emphasized, and precautions for safer use of the drug described.

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Papaverine Hydrochloride in Status Epilepticus

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Constriction of the pial vessels has been observed on the exposed brain during epileptic seizures.[1] Attempts to prevent convulsions by preventing spasm of these vessels have been made. Operations to this end such as cervical sympathectomy proved disappointing, as it could be shown that cerebral vessels possess local plexuses which control their reactions.[2] Certain drugs however are of value in this direction. Thus amyl nitrite may abort an epileptic fit if taken early during a long aura,[3] while veratum viride or its derivatives are useful in eclampsia.[4]

Accordingly, it seemed rational to try a vasodilating drug in the convulsive state, in which repeated or prolonged epileptiform seizures represent often a real therapeutic problem.

Papaverine hydrochloride appeared as the drug of choice. A potent vasodilator, it is a safe drug, in which poisoning has not been reported even when ten times the therapeutic dose has been ingested.[5] It has the additional advantage that it can be given subcutaneously as well as intravenously.

I had occasion lately to use this drug in three instances of status epilepticus.

Case 1: A 66 year old woman was seen twice in status epilepticus. Convulsions involved the left half of the body. This patient had epileptic fits repeatedly during the past five years.

Case 2: A 46 year old woman with generalized metastases from a carcinoma of the breast was seen in status epilepticus. The attack involved the left side of the body.

Case 3: A 70 year old woman was seen in status epilepticus. The attack involved the whole body. There was no history of previous seizures.

RESULTS

One grain of papaverine hydrochloride was injected intravenously on all four occasions. In each instance the patient developed decided blushing of the face and with this phenomenon relaxation of the previously involved muscles. The convulsions came to an end, while the patient fell asleep. There was uneventful recovery in these cases.

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Awards in Endocrinology

Three awards of $500.00 each have been sponsored by Roche-Organon, Inc., hormone manufacturers for scientists, in recognition of their recent outstanding research in these fields of endocrinology: animal experimentation, hormone chemistry, and clinical endocrinology. The winners of the 1947 awards are: Dr. Fuller Albright (clinical endocrinology), Dr. Robert D. H. Heard (hormone chemistry), and Dr. Dwight J. Ingle (animal experimentation).

The winners of the Roche-Organon awards were selected by the Committee on Awards of the Laurentian Hormone Conference which consists of Dr. Roy G. Hoskins, Chairman, and Drs. Edwin B. Astwood, Thomas F. Gallagher, Allan T. Kenyon, Robert L. Noble, and Abraham White. The awards were presented at the 1947 Laurentian Hormone Conference held recently at Ste. Adele, Quebec, Canada.

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